Appendix H. Comparison of Options by Biological Criterion

This appendix presents scores of each Option by biological criteria in Table H-1 through H-9. Table H-10 presents scores by metrics and tools for each biological criterion according to scales presented in Table 2-2.

Table H-1. Delta Smelt: Comparison of Options by Biological Criterion

Table H-2. Longfin Smelt: Comparison of Options by Biological Criterion

Table H-3. Sacramento River Chinook Salmon: Comparison of Options by Biological Criterion

Table H-4. San Joaquin River Chinook Salmon: Comparison of Options by Biological Criterion

Table H-5. Sacramento River Steelhead: Comparison of Options by Biological Criterion

Table H-6. San Joaquin River Steelhead: Comparison of Options by Biological Criterion

Table H-7. Green Sturgeon: Comparison of Options by Biological Criterion

Table H-8. White Sturgeon: Comparison of Options by Biological Criterion

Table H-9. Sacramento Splittail: Comparison of Options by Biological Criterion

Table H-10. Scores by Metrics and Tools for Biological Criteria

Appendix H. Comparison of Options by Biological Criterion

Table H-1. Delta Smelt: Comparison of Options by Biological Criterion

Criterion	Certainty[1]	Effects[2,3]			
		Option 1	Option 2	Option 3	Option 4
1. Relative degree to which the Option would reduce species mortality attributable to non-natural mortality sources, in order to enhance production (reproduction, growth, survival), abundance, and distribution for each of the covered fish species (BDCP Conservation Objective).	3	●	●●	●●●	●●●●
2. Relative degree to which the Option would provide water quality and flow conditions necessary to enhance production (reproduction, growth, survival), abundance, and distribution for each of the covered fish species (BDCP Conservation Objective).	3	●	●	●	●
3. Relative degree to which the Option would increase habitat quality, quantity, accessibility, and diversity in order to enhance and sustain production (reproduction, growth, survival), abundance, and distribution; and to improve the resiliency of each of the covered species' populations to environmental change and variable hydrology (BDCP Conservation Objective).	3	●	●●	●●●	●●●●
4. Relative degree to which the Option would increase food quality, quantity, and accessibility (e.g., phytoplankton, zooplankton, macro-invertebrates, forage fish) to enhance production (reproduction, growth, survival) and abundance for each of the covered fish species (BDCP Conservation Objective).	3	●	●●	●●●	●●●●
5. Relative degree to which the Option would reduce the abundance of non-native competitors and predators to increase native species production (reproduction, growth, survival), abundance and distribution for each of the covered fish species (BDCP Conservation Objective).	2	●●	●●●	●●●	●●●●
6. Relative degree to which the Option improves ecosystem processes in the BDCP planning area to support aquatic and associated habitats (BDCP Conservation Objective).	3	●	●●	●●●	●●●●
7. Relative degree to which the Option can be implemented within a timeframe to meet the near-term needs of each covered fish species (post BDCP authorization).	NA	●	●	●	●

[1]**Relative degree of certainty** of the magnitude of Option effect on the stressor: **4** = High **3** = Moderate **2** = Low **1** = little or no certainty. Relative degree of certainty assigned here is based on a qualitative combination of the certainty levels assigned to impact mechanisms relative to stressors (Appendix C) and the certainty level assigned to tools relative to metrics (Section 2)

[2]Derived from information presented in Table H-10

[3]**Effects (relative to base conditions):** ● = very low benefit, ●● = low benefit, ●●● = moderate benefit, ●●●● =high, ⊗ = no change, ○ = very low adverse effect, ○○ = low adverse effect, ○○○ = moderate adverse effect, ○○○○ = high adverse effect

Table H-2. Longfin Smelt: Comparison of Options by Biological Criterion

Criterion	Certainty[1]	Effects[2,3]			
		Option 1	Option 2	Option 3	Option 4
1. Relative degree to which the Option would reduce species mortality attributable to non-natural mortality sources, in order to enhance production (reproduction, growth, survival), abundance, and distribution for each of the covered fish species (BDCP Conservation Objective).	3	●	●●	●●●	●●●●
2. Relative degree to which the Option would provide water quality and flow conditions necessary to enhance production (reproduction, growth, survival), abundance, and distribution for each of the covered fish species (BDCP Conservation Objective).	3	●	●	●	●
3. Relative degree to which the Option would increase habitat quality, quantity, accessibility, and diversity in order to enhance and sustain production (reproduction, growth, survival), abundance, and distribution; and to improve the resiliency of each of the covered species' populations to environmental change and variable hydrology (BDCP Conservation Objective).	3	●	●●	●●	●●●
4. Relative degree to which the Option would increase food quality, quantity, and accessibility (e.g., phytoplankton, zooplankton, macro-invertebrates, forage fish) to enhance production (reproduction, growth, survival) and abundance for each of the covered fish species (BDCP Conservation Objective).	3	●	●●	●●●	●●●●
5. Relative degree to which the Option would reduce the abundance of non-native competitors and predators to increase native species production (reproduction, growth, survival), abundance and distribution for each of the covered fish species (BDCP Conservation Objective).	2	●●	●●●	●●●	●●●●
6. Relative degree to which the Option improves ecosystem processes in the BDCP planning area to support aquatic and associated habitats (BDCP Conservation Objective).	3	●	●●	●●●	●●●●
7. Relative degree to which the Option can be implemented within a timeframe to meet the near-term needs of each covered fish species (post BDCP authorization).	NA	●	●	●	●

[1]**Relative degree of certainty** of the magnitude of Option effect on the stressor: **4** = High **3** = Moderate **2** = Low **1** = little or no certainty. Relative degree of certainty assigned here is based on a qualitative combination of the certainty levels assigned to impact mechanisms relative to stressors (Appendix C) and the certainty level assigned to tools relative to metrics (Section 2)

[2]Derived from information presented in Table H-10

[3]**Effects (relative to base conditions):** ● = very low benefit, ●● = low benefit, ●●● = moderate benefit, ●●●● =high, ⊗ = no change, ○ = very low adverse effect, ○○ = low adverse effect, ○○○ = moderate adverse effect, ○○○○ = high adverse effect

Table H-3. Sacramento River Chinook Salmon: Comparison of Options by Biological Criterion

Criterion	Certainty[1]	Effects[2,3]			
		Option 1	Option 2	Option 3	Option 4
1. Relative degree to which the Option would reduce species mortality attributable to non-natural mortality sources, in order to enhance production (reproduction, growth, survival), abundance, and distribution for each of the covered fish species (BDCP Conservation Objective).	3	●	●	●●	●●●●
2. Relative degree to which the Option would provide water quality and flow conditions necessary to enhance production (reproduction, growth, survival), abundance, and distribution for each of the covered fish species (BDCP Conservation Objective).	3	⊗	⊗	○○	○
3. Relative degree to which the Option would increase habitat quality, quantity, accessibility, and diversity in order to enhance and sustain production (reproduction, growth, survival), abundance, and distribution; and to improve the resiliency of each of the covered species' populations to environmental change and variable hydrology (BDCP Conservation Objective).	3	●●	●●	⊗	●●●
4. Relative degree to which the Option would increase food quality, quantity, and accessibility (e.g., phytoplankton, zooplankton, macro-invertebrates, forage fish) to enhance production (reproduction, growth, survival) and abundance for each of the covered fish species (BDCP Conservation Objective).	3	⊗	⊗	⊗	⊗
5. Relative degree to which the Option would reduce the abundance of non-native competitors and predators to increase native species production (reproduction, growth, survival), abundance and distribution for each of the covered fish species (BDCP Conservation Objective).	2	●●	●●	●●	●●●●
6. Relative degree to which the Option improves ecosystem processes in the BDCP planning area to support aquatic and associated habitats (BDCP Conservation Objective).	3	●	●●	●●●	●●●●
7. Relative degree to which the Option can be implemented within a timeframe to meet the near-term needs of each covered fish species (post BDCP authorization).	NA	●	●	●	●

[1]**Relative degree of certainty** of the magnitude of Option effect on the stressor: **4** = High **3** = Moderate **2** = Low **1** = little or no certainty. Relative degree of certainty assigned here is based on a qualitative combination of the certainty levels assigned to impact mechanisms relative to stressors (Appendix C) and the certainty level assigned to tools relative to metrics (Section 2)

[2]Derived from information presented in Table H-10

[3]**Effects (relative to base conditions):** ● = very low benefit, ●● = low benefit, ●●● = moderate benefit, ●●●● =high, ⊗ = no change, ○ = very low adverse effect, ○○ = low adverse effect, ○○○ = moderate adverse effect, ○○○○ = high adverse effect

Table H-4. Sacramento River Steelhead: Comparison of Options by Biological Criterion

Criterion	Certainty[1]	Effects[2,3]			
		Option 1	Option 2	Option 3	Option 4
1. Relative degree to which the Option would reduce species mortality attributable to non-natural mortality sources, in order to enhance production (reproduction, growth, survival), abundance, and distribution for each of the covered fish species (BDCP Conservation Objective).	3	●	●	●●	●●●●
2. Relative degree to which the Option would provide water quality and flow conditions necessary to enhance production (reproduction, growth, survival), abundance, and distribution for each of the covered fish species (BDCP Conservation Objective).	3	⊗	⊗	○○	○
3. Relative degree to which the Option would increase habitat quality, quantity, accessibility, and diversity in order to enhance and sustain production (reproduction, growth, survival), abundance, and distribution; and to improve the resiliency of each of the covered species' populations to environmental change and variable hydrology (BDCP Conservation Objective).	3	●●	●●	⊗	●●
4. Relative degree to which the Option would increase food quality, quantity, and accessibility (e.g., phytoplankton, zooplankton, macro-invertebrates, forage fish) to enhance production (reproduction, growth, survival) and abundance for each of the covered fish species (BDCP Conservation Objective).	3	⊗	⊗	⊗	⊗
5. Relative degree to which the Option would reduce the abundance of non-native competitors and predators to increase native species production (reproduction, growth, survival), abundance and distribution for each of the covered fish species (BDCP Conservation Objective).	2	●●	●●	●●	●●●●
6. Relative degree to which the Option improves ecosystem processes in the BDCP planning area to support aquatic and associated habitats (BDCP Conservation Objective).	3	●	●●	●●●	●●●●
7. Relative degree to which the Option can be implemented within a timeframe to meet the near-term needs of each covered fish species (post BDCP authorization).	NA	●	●	●	●

[1]**Relative degree of certainty** of the magnitude of Option effect on the stressor: **4** = High **3** = Moderate **2** = Low **1** = little or no certainty. Relative degree of certainty assigned here is based on a qualitative combination of the certainty levels assigned to impact mechanisms relative to stressors (Appendix C) and the certainty level assigned to tools relative to metrics (Section 2)

[2]Derived from information presented in Table H-10

[3]**Effects (relative to base conditions):** ● = very low benefit, ●● = low benefit, ●●● = moderate benefit, ●●●● =high, ⊗ = no change, ○ = very low adverse effect, ○○ = low adverse effect, ○○○ = moderate adverse effect, ○○○○ = high adverse effect

Table H-5. San Joaquin River Chinook Salmon: Comparison of Options by Biological Criterion

Criterion	Certainty[1]	Effects[2,3]			
		Option 1	Option 2	Option 3	Option 4
1. Relative degree to which the Option would reduce species mortality attributable to non-natural mortality sources, in order to enhance production (reproduction, growth, survival), abundance, and distribution for each of the covered fish species (BDCP Conservation Objective).	3	⊗	●●	●●●	●●●●
2. Relative degree to which the Option would provide water quality and flow conditions necessary to enhance production (reproduction, growth, survival), abundance, and distribution for each of the covered fish species (BDCP Conservation Objective).	3	⊗	⊗	○	○
3. Relative degree to which the Option would increase habitat quality, quantity, accessibility, and diversity in order to enhance and sustain production (reproduction, growth, survival), abundance, and distribution; and to improve the resiliency of each of the covered species' populations to environmental change and variable hydrology (BDCP Conservation Objective).	3	●●	●●	●●	●●●●
4. Relative degree to which the Option would increase food quality, quantity, and accessibility (e.g., phytoplankton, zooplankton, macro-invertebrates, forage fish) to enhance production (reproduction, growth, survival) and abundance for each of the covered fish species (BDCP Conservation Objective).	3	⊗	⊗	⊗	⊗
5. Relative degree to which the Option would reduce the abundance of non-native competitors and predators to increase native species production (reproduction, growth, survival), abundance and distribution for each of the covered fish species (BDCP Conservation Objective).	2	●●	●●●	●●●	●●●●
6. Relative degree to which the Option improves ecosystem processes in the BDCP planning area to support aquatic and associated habitats (BDCP Conservation Objective).	3	●	●●	●●●	●●●●
7. Relative degree to which the Option can be implemented within a timeframe to meet the near-term needs of each covered fish species (post BDCP authorization).	NA	●	●	●	●

[1]**Relative degree of certainty** of the magnitude of Option effect on the stressor: **4** = High **3** = Moderate **2** = Low **1** = little or no certainty. Relative degree of certainty assigned here is based on a qualitative combination of the certainty levels assigned to impact mechanisms relative to stressors (Appendix C) and the certainty level assigned to tools relative to metrics (Section 2)

[2]Derived from information presented in Table H-10

[3]**Effects (relative to base conditions):** ● = very low benefit, ●● = low benefit, ●●● = moderate benefit, ●●●● =high, ⊗ = no change, ○ = very low adverse effect, ○○ = low adverse effect, ○○○ = moderate adverse effect, ○○○○ = high adverse effect

Table H-6. San Joaquin River Steelhead: Comparison of Options by Biological Criterion

Criterion	Certainty[1]	Effects[2,3]			
		Option 1	Option 2	Option 3	Option 4
1. Relative degree to which the Option would reduce species mortality attributable to non-natural mortality sources, in order to enhance production (reproduction, growth, survival), abundance, and distribution for each of the covered fish species (BDCP Conservation Objective).	3	⊗	●●	●●●	●●●●
2. Relative degree to which the Option would provide water quality and flow conditions necessary to enhance production (reproduction, growth, survival), abundance, and distribution for each of the covered fish species (BDCP Conservation Objective).	3	⊗	⊗	○	○
3. Relative degree to which the Option would increase habitat quality, quantity, accessibility, and diversity in order to enhance and sustain production (reproduction, growth, survival), abundance, and distribution; and to improve the resiliency of each of the covered species' populations to environmental change and variable hydrology (BDCP Conservation Objective).	3	●●	●●	●●	●●●●
4. Relative degree to which the Option would increase food quality, quantity, and accessibility (e.g., phytoplankton, zooplankton, macro-invertebrates, forage fish) to enhance production (reproduction, growth, survival) and abundance for each of the covered fish species (BDCP Conservation Objective).	3	⊗	⊗	⊗	⊗
5. Relative degree to which the Option would reduce the abundance of non-native competitors and predators to increase native species production (reproduction, growth, survival), abundance and distribution for each of the covered fish species (BDCP Conservation Objective).	2	●●	●●●	●●●	●●●●
6. Relative degree to which the Option improves ecosystem processes in the BDCP planning area to support aquatic and associated habitats (BDCP Conservation Objective).	3	●	●●	●●●	●●●●
7. Relative degree to which the Option can be implemented within a timeframe to meet the near-term needs of each covered fish species (post BDCP authorization).	NA	●	●	●	●

[1]**Relative degree of certainty** of the magnitude of Option effect on the stressor: **4** = High **3** = Moderate **2** = Low **1** = little or no certainty. Relative degree of certainty assigned here is based on a qualitative combination of the certainty levels assigned to impact mechanisms relative to stressors (Appendix C) and the certainty level assigned to tools relative to metrics (Section 2)

[2]Derived from information presented in Table H-10

[3]**Effects (relative to base conditions):** ● = very low benefit, ●● = low benefit, ●●● = moderate benefit, ●●●● =high, ⊗ = no change, ○ = very low adverse effect, ○○ = low adverse effect, ○○○ = moderate adverse effect, ○○○○ = high adverse effect

Table H-7. Green Sturgeon: Comparison of Options by Biological Criterion

Criterion	Certainty[1]	Effects[2,3]			
		Option 1	Option 2	Option 3	Option 4
1. Relative degree to which the Option would reduce species mortality attributable to non-natural mortality sources, in order to enhance production (reproduction, growth, survival), abundance, and distribution for each of the covered fish species (BDCP Conservation Objective).	3	⊗	⊗	○	○
2. Relative degree to which the Option would provide water quality and flow conditions necessary to enhance production (reproduction, growth, survival), abundance, and distribution for each of the covered fish species (BDCP Conservation Objective).	2	⊗	⊗	○	○
3. Relative degree to which the Option would increase habitat quality, quantity, accessibility, and diversity in order to enhance and sustain production (reproduction, growth, survival), abundance, and distribution; and to improve the resiliency of each of the covered species' populations to environmental change and variable hydrology (BDCP Conservation Objective).	3	●●	●●	●●	●●●
4. Relative degree to which the Option would increase food quality, quantity, and accessibility (e.g., phytoplankton, zooplankton, macro-invertebrates, forage fish) to enhance production (reproduction, growth, survival) and abundance for each of the covered fish species (BDCP Conservation Objective).	2	⊗	●●	●●	●●●
5. Relative degree to which the Option would reduce the abundance of non-native competitors and predators to increase native species production (reproduction, growth, survival), abundance and distribution for each of the covered fish species (BDCP Conservation Objective).	2	⊗	⊗	⊗	⊗
6. Relative degree to which the Option improves ecosystem processes in the BDCP planning area to support aquatic and associated habitats (BDCP Conservation Objective).	3	●	●●	●●●	●●●●
7. Relative degree to which the Option can be implemented within a timeframe to meet the near-term needs of each covered fish species (post BDCP authorization).	NA	●	●	●	●

[1]**Relative degree of certainty** of the magnitude of Option effect on the stressor: **4** = High **3** = Moderate **2** = Low **1** = little or no certainty. Relative degree of certainty assigned here is based on a qualitative combination of the certainty levels assigned to impact mechanisms relative to stressors (Appendix C) and the certainty level assigned to tools relative to metrics (Section 2)

[2]Derived from information presented in Table H-10

[3]**Effects (relative to base conditions):** ● = very low benefit, ●● = low benefit, ●●● = moderate benefit, ●●●● =high, ⊗ = no change, ○ = very low adverse effect, ○○ = low adverse effect, ○○○ = moderate adverse effect, ○○○○ = high adverse effect

Table H-8. White Sturgeon: Comparison of Options by Biological Criterion

Criterion	Certainty [1]	Effects[2,3]			
		Option 1	Option 2	Option 3	Option 4
1. Relative degree to which the Option would reduce species mortality attributable to non-natural mortality sources, in order to enhance production (reproduction, growth, survival), abundance, and distribution for each of the covered fish species (BDCP Conservation Objective).	3	⊗	⊗	○	●
2. Relative degree to which the Option would provide water quality and flow conditions necessary to enhance production (reproduction, growth, survival), abundance, and distribution for each of the covered fish species (BDCP Conservation Objective).	2	⊗	○	○	●●
3. Relative degree to which the Option would increase habitat quality, quantity, accessibility, and diversity in order to enhance and sustain production (reproduction, growth, survival), abundance, and distribution; and to improve the resiliency of each of the covered species' populations to environmental change and variable hydrology (BDCP Conservation Objective).	3	●	●●	●●	●●●
4. Relative degree to which the Option would increase food quality, quantity, and accessibility (e.g., phytoplankton, zooplankton, macro-invertebrates, forage fish) to enhance production (reproduction, growth, survival) and abundance for each of the covered fish species (BDCP Conservation Objective).	3	●	●●	●●	●●●
5. Relative degree to which the Option would reduce the abundance of non-native competitors and predators to increase native species production (reproduction, growth, survival), abundance and distribution for each of the covered fish species (BDCP Conservation Objective).	2	⊗	⊗	⊗	⊗
6. Relative degree to which the Option improves ecosystem processes in the BDCP planning area to support aquatic and associated habitats (BDCP Conservation Objective).	3	●	●●	●●●	●●●●
7. Relative degree to which the Option can be implemented within a timeframe to meet the near-term needs of each covered fish species (post BDCP authorization).	NA	●	●	●	●

[1]**Relative degree of certainty** of the magnitude of Option effect on the stressor: **4** = High **3** = Moderate **2** = Low **1** = little or no certainty. Relative degree of certainty assigned here is based on a qualitative combination of the certainty levels assigned to impact mechanisms relative to stressors (Appendix C) and the certainty level assigned to tools relative to metrics (Section 2)

[2]Derived from information presented in Table H-10

[3]**Effects (relative to base conditions):** ● = very low benefit, ●● = low benefit, ●●● = moderate benefit, ●●●● =high, ⊗ = no change, ○ = very low adverse effect, ○○ = low adverse effect, ○○○ = moderate adverse effect, ○○○○ = high adverse effect

Table H-9. Sacramento Splittail: Comparison of Options by Biological Criterion

Criterion	Certainty [1]	Effects[2,3]			
		Option 1	Option 2	Option 3	Option 4
1. Relative degree to which the Option would reduce species mortality attributable to non-natural mortality sources, in order to enhance production (reproduction, growth, survival), abundance, and distribution for each of the covered fish species (BDCP Conservation Objective).	3	●	●●	●●●	●●●●
2. Relative degree to which the Option would provide water quality and flow conditions necessary to enhance production (reproduction, growth, survival), abundance, and distribution for each of the covered fish species (BDCP Conservation Objective).	2	⊗	●	○	○
3. Relative degree to which the Option would increase habitat quality, quantity, accessibility, and diversity in order to enhance and sustain production (reproduction, growth, survival), abundance, and distribution; and to improve the resiliency of each of the covered species' populations to environmental change and variable hydrology (BDCP Conservation Objective).	3	●●	●●●	●●●	●●●●
4. Relative degree to which the Option would increase food quality, quantity, and accessibility (e.g., phytoplankton, zooplankton, macro-invertebrates, forage fish) to enhance production (reproduction, growth, survival) and abundance for each of the covered fish species (BDCP Conservation Objective).	3	●	●●	●●●	●●●●
5. Relative degree to which the Option would reduce the abundance of non-native competitors and predators to increase native species production (reproduction, growth, survival), abundance and distribution for each of the covered fish species (BDCP Conservation Objective).	2	●●	●●	●●●	●●●●
6. Relative degree to which the Option improves ecosystem processes in the BDCP planning area to support aquatic and associated habitats (BDCP Conservation Objective).	3	●	●●	●●●	●●●●
7. Relative degree to which the Option can be implemented within a timeframe to meet the near-term needs of each covered fish species (post BDCP authorization).	NA	●	●	●	●

[1]**Relative degree of certainty** of the magnitude of Option effect on the stressor: **4** = High **3** = Moderate **2** = Low **1** = little or no certainty. Relative degree of certainty assigned here is based on a qualitative combination of the certainty levels assigned to impact mechanisms relative to stressors (Appendix C) and the certainty level assigned to tools relative to metrics (Section 2)

[2]Derived from information presented in Table H-10

[3]**Effects (relative to base conditions):** ● = very low benefit, ●● = low benefit, ●●● = moderate benefit, ●●●● =high, ⊗ = no change, ○ = very low adverse effect, ○○ = low adverse effect, ○○○ = moderate adverse effect, ○○○○ = high adverse effect

Table H-10. Scores by Metrics and Tools for Biological Criteria

Metric	Relationship	Tools	Option scores[1]			
			1	2	3	4
Criterion #1. Relative degree to which the Option would reduce species mortality attributable to non-natural mortality sources, in order to enhance production (reproduction, growth, survival), abundance, and distribution for each of the covered fish species (BDCP Conservation Objective)						
B1. Opportunity for restoration of aquatic and intertidal habitat under the Option	Improving the quality and extent of aquatic and intertidal habitat in the Delta is hypothesized to reduce mortality by: ▪ Improving the abundance and availability of food that is more nutritious than non-native species; ▪ Create conditions that are less favorable for supporting non-native species that compete for food; and ▪ Create conditions that are less favorable to non-native predators and that reduce the susceptibility of covered fish species to predation. **Certainty:** 2	A. Proportion of the planning area available for restoration of high-function aquatic and intertidal habitats	**2**	**3**	**3**	**4**

[1] First score corresponds to Scenario A, second score corresponds to Scenario B where applicable

Table H-10. Scores by Metrics and Tools for Biological Criteria

Metric	Relationship	Tools	Option scores[1]			
			1	2	3	4
B2. Opportunity for improving inflows into the Delta	Changes in peak total Delta inflows during peak runoff periods change the frequency and duration of floodplain inundation and affect: ▪ Inputs of nutrients to the Delta, which affects food production and availability, ▪ Turbidity, which affects the foraging efficiency and predation vulnerability of delta and longfin smelt, ▪ Extent of food available for Sacramento splittail rearing. **Certainty:** 3	A. Change from base conditions in hydrologic modeling results for peak total Delta inflows during January-March	**3/4**	**4/4**	**1/1**	**1/1**
	The potential range of spring Delta inflow is indicative of the ability of the Option to dilute contaminants that could result in mortality **Certainty:** 3	B. Change from base conditions in hydrologic modeling results for Sacramento River flows at Rio Vista during March and April	**4/3**	**4/3**	**2/3**	**2/2**
	The potential range of spring Delta inflow is indicative of the ability of the Option to dilute contaminants that could result in mortality **Certainty:** 3	C. Change from base conditions in hydrologic modeling results for total Delta inflow during March and April	**4/4**	**4/4**	**2/3**	**2/3**

Table H-10. Scores by Metrics and Tools for Biological Criteria

Metric	Relationship	Tools	Option scores[1]			
			1	2	3	4
B3. Opportunities to improve hydraulic residence time	Changes in hydraulic residence time within the central Delta affect food production and turbidity which affects the foraging efficiency and vulnerability to predation of all species but splittail (splittail are addressed separately below). The particle tracking model approximates the likelihood of nutrients and food remaining in the central Delta **Certainty:** 3	A. Change from base conditions in particle tracking modeling results for percentage of particles after 14 days with "central" fate for the three hydrology conditions (50%, 70%, and 90% exceedance)	**2/3**	**4/4**	**5/5**	**5/5**
		B. Change from base conditions in particle tracking modeling results for percentage of particles after 28 days with "central" fate for the three hydrology conditions (50%, 70%, and 90% exceedance)	**1/4**	**5/4**	**5/5**	**5/5**
	Changes in hydraulic residence time within the central Delta affect food production and turbidity which affects the foraging efficiency and vulnerability to predation of splittail. The particle tracking model approximates the likelihood of nutrients and food remaining in the central Delta under drier conditions, when food is limiting to splittail **Certainty:** 4	A. Change from base conditions in particle tracking modeling results for percentage of particles after 14 days with "central" fate for the 50% exceedance hydrology	**2/1**	**3/3**	**4/4**	**4/4**
		B. Change from base conditions in particle tracking modeling results for percentage of particles after 28 days with "central" fate for the 50% exceedance hydrology	**1/1**	**4/3**	**5/5**	**5/5**

Table H-10. Scores by Metrics and Tools for Biological Criteria

Metric	Relationship	Tools	Option scores[1]			
			1	2	3	4
B4. Ability to reduce the export of nutrients and food from the Delta	The SWP/CVP export facilities and agricultural diversions entrain food and nutrients from the Delta that can affect food production and availability to all fish species but splittail. The particle tracking model approximates the likelihood for entrainment of nutrients and food of these diversions. **Certainty:** 3	A. Change from base conditions in particle tracking modeling results for percentage of particles after 14 days with either "SWP/CVP exports" or "agricultural diversions" fate for the three hydrology conditions (50%, 70%, and 90% exceedance)	**2/4**	**5/5**	**5/5**	**5/5**
		B. Change from base conditions in particle tracking modeling results for percentage of particles after 28 days with either "SWP/CVP exports" or "agricultural diversions" fate for the three hydrology conditions (50%, 70%, and 90% exceedance)	**1/4**	**4/4**	**5/5**	**5/5**
	The SWP/CVP export facilities and agricultural diversions entrain food and nutrients from the Delta that can affect food production and availability to splittail. The particle tracking model approximates the likelihood for entrainment of nutrients and food of these diversions under drier conditions, when food is limiting to splittail. **Certainty:** 4	C. Change from base conditions in particle tracking modeling results for percentage of particles after 14 days with either "SWP/CVP exports" or "agricultural diversions" fate for the 50% exceedance hydrological condition	**2/1**	**5/4**	**5/5**	**5/5**
		D. Change from base conditions in particle tracking modeling results for percentage of particles after 28 days with either "SWP/CVP exports" or "agricultural diversions" fate for the 50% exceedance hydrological condition	**2/2**	**4/4**	**4/4**	**5/5**

Table H-10. Scores by Metrics and Tools for Biological Criteria

Metric	Relationship	Tools	Option scores[1]			
			1	2	3	4
B5. Ability to reduce entrainment at the SWP/CVP export facilities	Entrainment of particles using the particle tracking model approximate the likelihood for entrainment of larval delta smelt and longfin smelt at the SWP/CVP facilities **Certainty:** 2	B. Change from base conditions in particle tracking modeling results for percentage of particles after 14 days for with "CVP/SWP exports" fate for the three hydrology conditions (50%, 70%, and 90% exceedance)	**2/4**	**5/5**	**5/5**	**5/5**
		C. Change from base conditions in particle tracking modeling results for percentage of particles after 28 days with "CVP/SWP exports" fate for the three hydrology conditions (50%, 70%, and 90% exceedance)	**1/4**	**4/4**	**5/5**	**5/5**
	There is evidence that the degree of reverse flow in Old and Middle Rivers is positively correlated to entrainment levels of juvenile and adult fish **Certainty:** 3	D. Change from base conditions in Old and Middle River reverse flows in modeling results during January	**4/5**	**5/5**	**5/5**	**5/5**
		E. Change from base conditions in Old and Middle River reverse flows in modeling results during April	**4/5**	**5/5**	**5/5**	**5/5**
Criterion #2. Relative degree to which the Option would provide water quality and flow conditions necessary to enhance production (reproduction, growth, survival) , abundance, and distribution for each of the covered fish species (BDCP Conservation Objective)						
B6. Ability to improve the location of the low salinity zone during sensitive periods	The location of X_2 during April is related to the production, growth, and survival of delta smelt and longfin smelt **Certainty:** 3	A. Change in modeling results for the location of X_2 during April from base conditions	**2/3**	**3/3**	**2/2**	**2/2**

Table H-10. Scores by Metrics and Tools for Biological Criteria

Metric	Relationship	Tools	Option scores[1]			
			1	2	3	4
B7. Ability to improve turbidity of Delta waters	Changes in turbidity of Delta waters affects foraging efficiency and predation vulnerability of delta and longfin smelt. The particle tracking model approximates the likelihood for entrainment of algae and other particles that contribute to turbidity at the SWP/CVP facilities. **Certainty:** 3	A. Change from base conditions in particle tracking modeling results for percentage of particles after 14 days with "central" fate for the three hydrology conditions (50%, 70%, and 90% exceedance)	**2/3**	**4/4**	**5/5**	**5/5**
		B. Change from base conditions in particle tracking modeling results for percentage of particles after 28 days with "central" fate for the three hydrology conditions (50%, 70%, and 90% exceedance)	**1/4**	**5/4**	**5/5**	**5/5**
	Changes in peak total Delta inflows during peak runoff periods affects sediment inputs that govern turbidity in Delta waters which affects the foraging efficiency and vulnerability to predation. **Certainty:** 3	C. Change from base conditions in hydrologic modeling results for peak total Delta inflows during January-March	**3/4**	**4/4**	**1/1**	**1/1**
	Reduction in abundance of non-native species like filter-feeding clams (*Corbula, Corbicula*) and aquatic vegetation (*Egeria*, water hyacinth) could result in an increase in turbidity, Certainty: 2	D. Proportion of the planning area available for restoration of high-function aquatic and intertidal habitats	**2**	**3**	**3**	**4**

Table H-10. Scores by Metrics and Tools for Biological Criteria

Metric	Relationship	Tools	Option scores[1]			
			1	2	3	4
B8. Ability to improve net downstream flow	Changes in net downstream flow affects downstream transport of larval and juvenile fish. The particle tracking model approximates downstream transport of larvae and young juveniles from all Covered Species of fish except green and white sturgeon. **Certainty:** 2	A. Change from base conditions in particle tracking modeling results for percentage of particles after 14 days with either "past Chipps Island" or "to Suisun Marsh" fate for the three hydrology conditions (50%, 70%, and 90% exceedance)	**2/5**	**4/5**	**3/2**	**3/3**
		B. Change from base conditions in particle tracking modeling results for percentage of particles after 28 days with either "past Chipps Island" or "to Suisun Marsh" fate for the three hydrology conditions (50%, 70%, and 90% exceedance)	**2/5**	**5/5**	**4/3**	**4/4**
	Changes in spring Sacramento River flow at Rio Vista affects downstream transport of larval and juvenile fish and upstream migration cues for adult salmonids. **Certainty:** 2	C. Change from base conditions in hydrologic modeling results for Sacramento River flows at Rio Vista during March and April	**4/3**	**4/3**	**2/3**	**2/2**
	Changes in spring total Delta outflow affects downstream transport of larval and juvenile fish and upstream migration cues for adult salmonids. **Certainty:** 3	D. Change from base conditions in hydrologic modeling results for total Delta outflow during March and April	**3/5**	**5/5**	**2/2**	**2/3**

Table H-10. Scores by Metrics and Tools for Biological Criteria

Metric	Relationship	Tools	Option scores[1]			
			1	2	3	4
B9. Ability to provide cool water flows in the Sacramento, American, and Feather Rivers	The temperatures of water released from Shasta, Oroville, and Folsom Reservoirs may vary under the Options and, therefore, have differing effects on Sacramento River salmonids and sturgeon **Certainty:** 3	Change from base conditions in hydrologic modeling results for Shasta Reservoir storage volume	**3/3**	**4/3**	**3/3**	**3/1**
		Change from base conditions in hydrologic modeling results for Oroville Reservoir storage volume	**3/3**	**5/5**	**4/3**	**3/1**
		Change from base conditions in hydrologic modeling results for Folsom Reservoir storage volume	**3/4**	**4/4**	**3/3**	**2/1**
Criterion #3. Relative degree to which the Option would increase habitat quality, quantity, accessibility, and diversity in order to enhance and sustain production (reproduction, growth, survival), abundance, and distribution; and to improve the resiliency of each of the covered species' populations to environmental change and variable hydrology (BDCP Conservation Objective).						
B10. Opportunity for restoration of aquatic and intertidal habitat under the Option	Improving the quality and extent of aquatic and intertidal habitat in the Delta for covered species will increase the production, abundance, and distribution of covered species. **Certainty:** 2	A. Proportion of the planning area available for restoration of high-function aquatic and intertidal habitats	**2**	**3**	**3**	**4**

Table H-10. Scores by Metrics and Tools for Biological Criteria

Metric	Relationship	Tools	Option scores[1]			
			1	2	3	4
B11. Improve accessibility to spawning and rearing habitat	Changes in peak total Delta inflows during peak runoff periods change the frequency and duration of floodplain inundation that provides splittail spawning and larval rearing habitat. **Certainty:** 4	B. Change from base conditions in modeling results for peak total Delta inflows during January-March	**3/4**	**4/4**	**1/1**	**1/1**
	The location of X_2 during April determines the extent of rearing habitat available for delta and longfin smelt **Certainty:** 3	A. Change from base conditions in modeling results for the location of X_2 during April	**2/3**	**3/3**	**2/2**	**2/2**
B12. Ability to improve turbidity of Delta waters	Changes in turbidity of Delta waters affects foraging efficiency and predation vulnerability of delta and longfin smelt. The particle tracking model approximates the likelihood for entrainment of algae and other particles that contribute to turbidity at the SWP/CVP facilities. **Certainty:** 3	A. Change from base conditions in particle tracking modeling results for percentage of particles after 14 days with "central" fate for the three hydrology conditions (50%, 70%, and 90% exceedance)	**2/3**	**4/4**	**5/5**	**5/5**
		B. Change from base conditions in particle tracking modeling results for percentage of particles after 28 days with "central" fate for the three hydrology conditions (50%, 70%, and 90% exceedance)	**1/4**	**5/4**	**5/5**	**5/5**

Table H-10. Scores by Metrics and Tools for Biological Criteria

Metric	Relationship	Tools	Option scores[1]			
			1	2	3	4
	Changes in peak total Delta inflows during peak runoff periods affects sediment inputs that govern turbidity in Delta waters which affects the foraging efficiency and vulnerability to predation. **Certainty:** 3	C. Change from base conditions in hydrologic modeling results for peak total Delta inflows during January-March	**3/4**	**4/4**	**1/1**	**1/1**
	Reduction in abundance of non-native species like filter-feeding clams (*Corbula, Corbicula*) and aquatic vegetation (*Egeria*, water hyacinth) could result in an increase in turbidity, Certainty: 2	D. Proportion of the planning area available for restoration of high-function aquatic and intertidal habitats	**2**	**3**	**3**	**4**
B13. Ability to improve net downstream flow	Changes in net downstream flow affects downstream transport of larval and juvenile fish to rearing habitat. The particle tracking model approximates downstream transport of larvae and young juveniles from all Covered Species of fish except green and white sturgeon. . **Certainty:** 2	A. Change from base conditions in particle tracking modeling results for percentage of particles after 14 days with either "past Chipps Island" or "to Suisun Marsh" fate for the three hydrology conditions (50%, 70%, and 90% exceedance)	**2/5**	**4/5**	**3/2**	**3/3**
		B. Change from base conditions in particle tracking modeling results for percentage of particles after 28 days with either "past Chipps Island" or "to Suisun Marsh" fate for the three hydrology conditions (50%, 70%, and 90% exceedance)	**2/5**	**5/5**	**4/3**	**4/4**

Table H-10. Scores by Metrics and Tools for Biological Criteria

Metric	Relationship	Tools	Option scores[1]			
			1	2	3	4
	Changes in spring Sacramento River flow affects downstream transport of larval and juvenile delta smelt, longfin smelt and splittail to rearing habitat. **Certainty:** 3	E. Change from base conditions in hydrologic modeling results for Sacramento River flows at Rio Vista during March and April	**4/3**	**4/3**	**2/3**	**2/2**
	Changes in total spring Delta outflow affects downstream transport of larval and juvenile delta and longfin smelt to rearing habitat. **Certainty:** 3	D. Change from base conditions in hydrologic modeling results for total Delta outflow during March and April	**3/5**	**5/5**	**2/2**	**2/3**
Criterion #4. Relative degree to which the Option would increase food quality, quantity, and accessibility (e.g., phytoplankton, zooplankton, macro-invertebrates, forage fish) to enhance production (reproduction, growth, survival) and abundance for each of the covered fish species (BDCP Conservation Objective).						
B14. Opportunities for restoration of aquatic and intertidal habitat	Improving the quality and extent of aquatic and intertidal habitat in the Delta is hypothesized to reduce mortality by: ▪ Improving the abundance and availability of native prey species that are more nutritious than non-native species; and ▪ Create conditions that are less favorable for supporting non-native species that compete for food. **Certainty:** 2	A. Proportion of the planning area available for restoration of high-function aquatic and intertidal habitats	**2**	**3**	**3**	**4**

Table H-10. Scores by Metrics and Tools for Biological Criteria

Metric	Relationship	Tools	Option scores[1]			
			1	2	3	4
B15. Opportunities for improving peak inflows into the Delta	Changes in peak total Delta inflows during peak runoff periods change the frequency and period of floodplain inundation affect: ▪ Inputs of nutrients to the Delta, which affects food production and availability, ▪ Turbidity, which affects the foraging efficiency and predation vulnerability of delta and longfin smelt, ▪ Extent of food available for Sacramento splittail rearing. **Certainty:** 3	A. Change from base conditions in modeling results for peak total Delta inflows during January-March	**3/4**	**4/4**	**1/1**	**1/1**
B16. Opportunities to improve hydraulic residence time	Changes in hydraulic residence time within the central Delta affect food production and turbidity which affects the foraging efficiency to all fish species but splittail (splittail are addressed separately below). The particle tracking model approximates the likelihood for particles remaining in the central Delta.	A. Change from base conditions in particle tracking modeling results for percentage of particles after 14 days with "central" fate for the three hydrology conditions (50%, 70%, and 90% exceedance)	**2/3**	**4/4**	**4/5**	**5/5**

Table H-10. Scores by Metrics and Tools for Biological Criteria

Metric	Relationship	Tools	Option scores[1]			
			1	2	3	4
	Certainty: 3	B. Change from base conditions in particle tracking modeling results for percentage of particles after 28 days with "central" fate for the three hydrology conditions (50%, 70%, and 90% exceedance)	**1/4**	**5/4**	**5/5**	**5/5**
	Changes in hydraulic residence time within the central Delta affect food production and turbidity which affects the foraging efficiency to all fish species but splittail. The particle tracking model approximates the likelihood for particles remaining in the central Delta under drier conditions, when food is limiting to splittail **Certainty:** 4	C. Change from base conditions in particle tracking modeling results for percentage of particles after 14 days with "central" fate for the 50% exceedance hydrological condition	**2/1**	**3/3**	**4/4**	**4/4**
		D. Change from base conditions in particle tracking modeling results for percentage of particles after 28 days with "central" fate for the 50% exceedance hydrological condition	**1/1**	**4/3**	**5/5**	**5/5**
B17. Ability to reduce the export of nutrients and food from the Delta	The SWP/CVP export facilities and agricultural diversions entrain food and nutrients from the Delta that can affect food production and availability to all fish species but splittail. The particle tracking model approximates the likelihood for entrainment of nutrients and food of these diversions. **Certainty:** 3	A. Change from base conditions in particle tracking modeling results for percentage of particles after 14 days with either "SWP/CVP exports" or "agricultural diversions" fate for the three hydrology conditions (50%, 70%, and 90% exceedance)	**2/4**	**5/5**	**5/5**	**5/5**

Table H-10. Scores by Metrics and Tools for Biological Criteria

Metric	Relationship	Tools	Option scores[1]			
			1	2	3	4
		B. Change from base conditions in particle tracking modeling results for percentage of particles after 28 days with either "SWP/CVP exports" or "agricultural diversions" fate for the three hydrology conditions (50%, 70%, and 90% exceedance)	**1/4**	**4/4**	**5/5**	**5/5**
	The SWP/CVP export facilities and agricultural diversions entrain food and nutrients from the Delta that can affect food production and availability to splittail. The particle tracking model approximates the likelihood for entrainment of nutrients and food of these diversions under drier conditions, when food is limiting to splittail.. **Certainty:** 4	C. Change from base conditions in particle tracking modeling results for percentage of particles after 14 days with either "SWP/CVP exports" or "agricultural diversions" fate for the 50% exceedance hydrological condition	**2/1**	**5/4**	**5/5**	**5/5**
		D. Change from base conditions in particle tracking modeling results for percentage of particles after 28 days with either "SWP/CVP exports" or "agricultural diversions" fate for the 50% exceedance hydrological condition	**2/2**	**4/4**	**4/4**	**5/5**
Criterion #5. Relative degree to which the Option would reduce the abundance of non-native competitors and predators to increase native species production (reproduction, growth, survival), abundance and distribution for each of the covered fish species (BDCP Conservation Objective).						

Table H-10. Scores by Metrics and Tools for Biological Criteria

Metric	Relationship	Tools	Option scores[1]			
			1	2	3	4
B18. Opportunity for restoration of aquatic and intertidal habitat under the Option	Improving the quality and extent of aquatic and intertidal habitat in the Delta is hypothesized to: ▪ Create conditions that are less favorable for supporting non-native species that compete for food; and ▪ Create conditions that are less favorable to non-native predators and that reduce the vulnerability of covered fish species to predation. **Certainty:** 2	A. Proportion of the planning area available for restoration of high-function aquatic and intertidal habitats	**2**	**3**	**3**	**4**
Criterion #6. Relative degree to which the Option improves ecosystem processes in the BDCP planning area to support aquatic and associated habitats (BDCP Conservation Objective).						
B19. Opportunities for restoration of aquatic and intertidal habitat under the Option	Improving the quality and extent of aquatic and intertidal habitat in the Delta is hypothesized to contribute to higher levels of ecosystem function **Certainty:** 2	A. Proportion of the planning area available for restoration of high-function aquatic and intertidal habitats	**2**	**3**	**3**	**4**

Table H-10. Scores by Metrics and Tools for Biological Criteria

Metric	Relationship	Tools	Option scores[1]			
			1	2	3	4
B20. Opportunity to improve hydraulic residence time	Changes in hydraulic residence time within the central Delta affect food production and turbidity, which should contribute to higher levels of ecosystem function to all fish species but splittail (splittail are addressed separately below). The particle tracking model approximates the likelihood for particles remaining in the central Delta. **Certainty:** 3	A. Change from base conditions in particle tracking modeling results for percentage of particles after 14 days with "central" fate for the three hydrology conditions (50%, 70%, and 90% exceedance)	**2/3**	**4/4**	**4/5**	**5/5**
		B. Change from base conditions in particle tracking modeling results for percentage of particles after 28 days with "central" fate for the three hydrology conditions (50%, 70%, and 90% exceedance)	**1/4**	**5/4**	**5/5**	**5/5**
Criterion #7. Relative degree to which the Option can be implemented within a timeframe to meet the near-term needs of each covered fish species (post BDCP authorization).						
B21. Likelihood that the Option can be implemented before populations decline sufficiently to inhibit the likelihood for their future recovery	The longer the period required for implementation of the Option the less likely the Option will meet the near-term needs of covered fish species **Certainty:** Definitions not applicable.	Estimated time post-BDCP approval required to complete planning, design, and construction phases of Option implementation infrastructure	**5**	**5**	**5**	**5**

This page intentionally left blank.